

Version 1.3

FENCE LAB PRELIMINARY RESULTS

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**by Fence Lab Project IPT
(CBP SBInet PMO)**

CONTENTS

1. Overview of Fence Lab Selection Guide.....	3
2. Summary Evaluation of Fence/Barriers Against Fence Lab Performance Requirements.....	5
3. Summary Evaluation of Fence/Barriers Against Fence Lab Performance Goals.....	6
4. High Level Review of Fence/Barrier Compatibility with Additional PF 225 Requirements.....	7
5. High Level Review of Fence/Barrier Compatibility with Different Terrain	8
6. High Level Review of Fence/Barrier Compatibility with Different Soils.....	9
7. High Level Review of Fence/Barrier Compatibility with IBWC Requirements.....	10
8. High Level Review of Fence/Barriers Against Different Configurations.....	11
9. High Level Review of Fence/Barriers Against 1999 Army Corp Lessons Learned.....	12
10. High Level Review of Fence/Barriers Against Different Fencing Materials.....	13
11. Samples Pictures of Different Fencing Materials that May Be Interchangeable.....	14
12. Estimated Cost Comparisons of Different Fence/Barriers.....	18
13. Full Range of Tactical Application of Fence/Barriers.....	21
14. RED TEAM Maintenance/Reparability Analysis for Each Design.....	19
15. Summary Data Sheets for Each Individual Design	26

OVERVIEW OF FENCE LAB SELECTION GUIDE

Purpose:

The purpose of the Fence Lab Selection Guide is to provide a comparison of the (b) (7)(E) different fence/barriers considered by the SBInet Fence Lab with respect to the many different factors one may consider in selecting a fence/barrier for deployment on the Southwest border. The objective is to assist decision makers as much as possible in matching fence/barriers (in the tool box) to the needs of different localities.

Background:

In November 2006, the SBInet Program Management Office (PMO) established the Fence Lab Project. By late December, the Fence Lab Project identified (b) (7) performance criteria relevant to SW border applications. In parallel, Boeing was tasked to solicit Commercial off the shelf (COTS) fencing solutions from their supplier database for potential construction, testing and evaluation.

Boeing identified (b) (7) potentially qualified suppliers, of which (b) (7) suppliers submitted designs that claimed to meet the Fence Lab Performance Criteria during a two week period in late December. Due to the unique requirements to secure the Southwest Border, none of the suppliers submitted Commercial-Off-The-Shelf (COTS) fence/barriers. Instead, all of the suppliers submitted designs comprised of COTS parts and materials (typically from similar in-house products), thus making each of their designs largely untested prototypes.

On March 13, 2007, these (b) (7)(E) commercial designs were "down selected" by SBInet to (b) (7)(E), for construction and testing at the Fence Lab test site at the (b) (7)(E). Three additional government solutions were also identified for construction, testing and evaluation (b) (7)(E) (CBP (b) (7)(E)).

On March 16th, the Boeing contract was awarded to construct, test, and evaluate the (b) (7)(E) candidates at (b) (7)(E) (Six hybrid COTS and three government developed solutions) and present the results in an Interim Report within eight weeks (i.e., May 11, 2007). The Boeing scope for the contract was originally developed and finalized in December/January 2006, and was limited to test and evaluation against the Fence Lab's (b) (7)(E) original Performance Criteria (i.e., no integrated testing, etc).

During the four months since the (b) (7)(E) Performance Criteria were developed, additional requirements and evaluation factors were identified from different sources: PF 225; Environmental (IBWC); System of Systems (SoS) Workshops; Border Patrol Representatives; and technical Subject Matter Experts (SMEs) retained by the Project (i.e., Fencing/Structural/Security Experts).

Due to the short performance period, the Fence Lab team performed high-level assessments comparing the (b) (7)(E) candidate fence/barriers in (b) (7)(E) level "Consumer Report" types of ranking. Although there may be specific areas where the comparisons could be refined with a more quantitative, detailed

analysis, the current approach provides a straight forward, accessible, and graphic presentation of the designs performance.

The Fence Lab Preliminary Results are the culmination of such efforts to assist the user as much as possible in matching fence/barriers (in the tool box) to the needs of different localities. Where possible, the evaluations are based on factual data. Where not possible (given the short performance period and limited resources), the evaluations are “ball-park” best estimates and predictions based on defined methods and/or SME knowledge and opinions.

Each Section Represents Key Decision Components

Each of the sections contained in the Fence Lab Preliminary Results represent key decision components (factors) that one may consider when selecting fence/barriers to deploy at different localities on the South West Border. In summary, those decision components include:

- Program wide requirements/goals (i.e., Fence Lab Performance Criteria);
- Project Specific requirements/goals (i.e., Additional PF 225 Requirements);
- Terrain, Soil, and Environmental Conditions (Site Specific);
- Different Fencing Material which may be Interchangeable;
- Strategic and Tactical Application;
- Real World Experiences (past lessons learned, vulnerabilities analysis, maintenance realities).

Legend:

Because different tables-matrices enclosed in this document may be comprised of different evaluation criteria, requirements and factors, it is difficult to provide one hundred percent uniform ratings from one table-matrix to another.

Therefore, the following legend is provided as general guidelines for using the document:

GREEN	<ul style="list-style-type: none"> - Meets or exceeds the criteria (requirement or goal); or - Suitable for application (i.e., no misgivings); or - Performance is good relative to others.
YELLOW	<ul style="list-style-type: none"> - Meets most facets/components of the criteria, but has some minor deficiency; or - Will meet the criteria or application as is, but feasibility or cost effectiveness has not been discerned; or - Will meet the criteria or application with minor modifications; or - Performance is moderate compared to others.
RED	<ul style="list-style-type: none"> - Does not meet the criteria or application; or - Has some major deficiency, flaw, concern, or red flag; or - Will meet the criteria or application with only major modifications; or - Performance is poor compared to others.

Summary Evaluation of Fence/Barriers Against Fence Lab Performance Requirements (Established 12/21/06)

SBINET FENCE/BARRIER DESIGN	Ability to Disable a (b) (7)(E) Crash Test	Ability to Deploy (b) (7)(E)	(b) (7)(E)	Survive Temperatures on SW Border	See Through with Human Eyes	Minimum Desert and Open Range, but also Mountain, Remote, & Forests	Ability to Deploy (b) (7)(E) Terrain
(b) (7)(E)	(b) (7)(E)						

Note: * Based on SME analysis contained in Soil and Terrain Matrices contained herein.

Summary Evaluation of Fence/Barriers Against Fence Lab Performance Goals (Established 12/21/06)

SBINET FENCE/BARRIER DESIGN	Minimize Total Cost and Maximize Ability to Deploy	Minimize Crew Size to Install & Maintain	Minimum Height of ^{(b)(7)(E)} feet, with ^{(b)(7)(E)} Goal	No Water for Concrete at Install	Minimum ^{(b)(7)(E)} Maintenance, with ^{(b)(7)(E)} Year Goal	Maximum Life and Warranty	Withstand Sustained Wind of ^{(b)(7)(E)} mph	Readily Available Materials & Parts	Cannot Easily be Bridged	Allows water to flow Freely & No Ponding	Allows Migration with Min. Impact on Habitat & Patterns	Minimal Environmental Impact
(b) (7)(E)	(b) (7)(E)											

Notes: *
**

Cost estimate based on 2007 vendor cost estimates/proposals;

Cost estimate based on 2007 prototype test section scaled to 1 mile (with no consideration for economies of scale and competitive bidding);

Cost estimate based on 2006 Baker Engineering ROMs for roughly similar design. Recent 2007 estimates for Tucson had ^{(b)(7)(E)} at ^{(b)(7)(E)}/Mile.

High Level Review of Fence/Barriers Against Additional PF 225 Requirements*

SBINET FENCE/BARRIER DESIGN**	Objective, Threshold (b) (7)(E)	Cannot Cut (b) (7)(E) in (b) (7)(E) Minutes Objective	Deterrence to Digging (b) (7)(E) Below Surface	IBWC Gates	Can be Constructed Within (b) (7)(E) of Border	Service Life of (b) (7)(E) Years	Restore in (b) (7)(E) Week & Temporarily Repair in (b) (7)(E) Hours	Temporary Construction Easement of (b) (7)(E) ***
(b) (7)(E)	(b) (7)(E)							

Notes: * Additional PF225 primary fencing criteria as of 4/2/07 that differ from Fence Lab Performance Criteria as of 12/28/06.
 ** Deployment will require site adaptation of all solutions.
 *** Should be able to work within 60' easement per existing CBP fence projects.

High Level Review of Fence/Barrier Compatibility with Different Terrain

SBINET FENCE/BARRIER DESIGN	Flat	Rolling Hills	Rocky Hills	Ravines	Mountain	Water front	Swamp Marsh	Flood Zone
(b) (7)(E)	(b) (7)(E)							

Methodology Employed: This table is the average rating from three different tables (corrosion, performance and installation) scored on an evaluation scale of 1 to 10. Corrosion – Any soils containing significant moisture were considered to be corrosive and any fence containing significant metal content was marked down in these soils. Performance – based on the structure of each fence, an analysis was done to determine how the terrain will affect performance of each fence. Installation – Each fence was analyzed to grade ease of installation in each type of terrain. The score was based on the ruggedness of the terrain and the equipment anticipated for installation each fence.

High Level Review of Fence/Barrier Compatibility with Different Soils

SBINET FENCE/BARRIER DESIGN	Standard Soil	Sand	Rock	Clay	Mud	Alkali	Salt	Saturated
(b) (7)(E)	(b) (7)(E)							

Methodology Employed: This table is the average rating from four different tables scored on an evaluation scale of 1 to 10. This table is a numerical average of four tables. Each of the four tables contains a grade for each fence against each soil type. Each table represents a critical design factor. The four tables are corrosion, performance, installation, and susceptibility to freeze/thaw related ground heave. Corrosion – Each fence type containing significant metal was graded lower in soils that are corrosive in nature. Performance – Based on an engineering analysis of the structure/foundation of each fence, scores were assigned to each fence based on the anticipated differences in performance due to the soil type. If the Fence performance was poor in the standard soil configuration, it was less than or equal in other soils. Installation – Based on the foundation types and method of construction scores are assigned to each fence. At a high level fence that requires significant ground disturbance was graded lower as the soil type gets harder. The least disturbance is a surface mount, next is driven foundation and augured foundations, then trenching, and the most ground disturbance was attributed to excavation. Heave – Based on an analysis of the foundations, scores were assigned to each fence for each soil. This score is a combination of the susceptibility to heave of a given soil and the susceptibility to heave damage of each fence foundation design.

High Level Review of Fence/Barrier Compatibility with IBWC Requirements *

SBINET FENCE/BARRIER DESIGN**	Water Flow Passage ***	Line of Sight Unhindered	Collapsible /Removal Within (b) (7)(E)	Debris Passage ****	Animal Migration *****	Gate Installation
(b) (7)(E)	(b) (7)(E)					

- Notes:
- * All projects on Southern Border require IBWC approval.
 - ** Deployment will require site adaptation of all solutions.
 - *** Drainage structures will require security grates for mission requirements. Hydrology studies will be required.
 - **** Must pass smaller debris and prevent water ponding. Hydrology studies will be required.
 - ***** Must pass native and migrating species.

High Level Review of Fence/Barriers Against Different Applications

SBINET FENCE/BARRIER DESIGN	Dual Purpose Only (Both Vehicle and Pedestrian)	Vehicle Barrier Only	Pedestrian Fencing Only	Primary Fence (b) (7)(E)	Secondary Fence (b) (7)(E)	Use With Other Infrastructure (Engineered Barriers)*
(b) (7)(E)	(b) (7)(E)					

Notes:

* (b) (7)(E) Other infrastructure (engineered barriers) includes berms, ditches, speed bumps, etc.

** (b) (7)(E) s.

High Level Review of Fence/Barriers Against 1999 Army Corp Lessons Learned*

SBINET FENCE/BARRIER DESIGN**	Footings Adequacy ***	Thermal Expansion and Contraction	Corrosion Protection	Wind Erosion Protection	Flash Flooding Adequacy	Active Degradation Adequacy (Breaching & Vandalism) ****
(b) (7)(E)	(b) (7)(E)					

Notes: * Ref: USACERL Technical Report 99/28, February 1999 Engineering Life-Cycle Cost Comparison Study of Barrier Fencing Systems and USACERL 99/Draft, March 1999, Analysis of Anti-Drug Effectiveness of DoD Funded Border Fencing.

** Deployment will require site adaptation of all solutions.

*** Soil conditions, loads and terrain will dictate specific design requirements per site.

**** (b) (7)(E), etc.

High Level Review of Fence/Barriers Against Different Fencing Materials

SBINET FENCE/BARRIER DESIGN	(b) (7)(E)	Ornamental	Inexpensive (for Remote Applications)	(b) (7)(E)	
(b) (7)(E)	(b) (7)(E)				

Notes: Aesthetic panels could be attached to any fence structure. (b) (7)(E) is the only accepted form of aesthetic fencing in many locales. However, although theoretically possible, ornamental fencing (like (b) (7)(E)) and (b) (7)(E) fencing may not be easily adapted to these fence systems, such that it would probably be most economically feasible to pursue completely new designs.

Sample Pictures of Different Fencing Materials that May Be Interchangeable

(b) (7)(E)

(b) (7)(E)

(b) (7)(E)

(b) (7)(E)